

THE ECOLOGICAL AND EVOLUTIONARY SIGNIFICANCE OF TRILLIUM HYBRID SWARMS ON SOUTH MANITOU ISLAND, LAKE MICHIGAN.

PETER M. HURLEY & DAVID J. FLASPOHLER, School of Forest Resources and Environmental Science, Michigan Technological University.

Summary

We will investigate the possibility of introgressive hybridization between *Trillium erectum* and *T. flexipes* on South Manitou Island. *T. flexipes* and *T. erectum* are members of the taxonomically difficult *Trillium erectum* complex, a monophyletic species group within Trilliaceae. Species within this complex are thought to readily hybridize where populations overlap, and the occurrence of reticulate evolution seems probable in some cases. Despite the apparent frequency of the phenomenon within the *erectum* complex, no published work has yet investigated the ecological or evolutionary implications of hybridization and/or genetic introgression within this group. Recent surveys suggest that hybrid genotypes are common in South Manitou's hardwood forests. Additionally, intermediate or hybrid forms appear to be more common than parental forms, suggesting the possibility of either an allopolyploid or homoploid speciation event. We will use a combination of molecular and morphological approaches to test the hypothesis that the island's numerically dominant phenotypes are of hybrid origin. If evidence of introgressive hybridization is found, we will further examine the possibility of adaptive evolution as a consequence of genetic introgression or hybridization in the *erectum* complex, both on South Manitou Island and in other areas where hybrid swarms are known to occur.

Questions.

- (1) Are the unusual populations on South Manitou Island a consequence of introgressive hybridization between *T. erectum* and *T. flexipes*?
- (2) Does *T. cernuum* also play a role (e.g. genetic introgression of two species into a third, or three-way hybridization)?
- (2) Do the widespread, unusual variants represent stabilized hybrids/introgessants (i.e. has there been selection for "fit" recombinant genotypes (Figure 3).
- (4) Is there evidence of reproductive isolation between parental and hybrid forms?
- (5) Is there evidence of ecological divergence and adaptive evolution as a consequence of hybridization?

Initially, we will address questions one through three with a combination of molecular marker and morphometric techniques. Questions four and five will be addressed depending on the results of molecular marker work.

Methods

We will use a combination of morphometric and molecular marker approaches to test the hypothesis that unusual populations on South Manitou Island are of hybrid origin.

Morphological measurements will include measurements on morphological features that are well established as being more variable between than within species. We will use appropriate multivariate methods to detect possible hybridization.

Molecular marker approaches will include amplified fragment length polymorphism (AFLP) and allozyme analyses. Though allozymes generally show low polymorphism levels, they have been reliably used in studies of hybridization and introgression (Lowe *et al.* 2004), and are both cheap and easily obtained. AFLPs have recently been used in several studies of hybridization and introgression, and show some promise for delineating species and population relationships within the *erectum* complex. (Kendra Millam, personal communication).

We will make morphological measurements and collect small leaf samples (~ 2 grams) from approximately 120 randomly located flowering individuals of 3 phenotypic classes: 1) 30 phenotypes resembling *T. erectum*, 2) 30 phenotypes resembling *T. flexipes*, 3) 60 phenotypes intermediate between *T. erectum* and *T. flexipes*. Samples will be preserved for subsequent genetic analysis by desiccation with fine grain silica gel.